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McGill

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[54] **DEFORMABLE CONTAINER**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[6] **B65B 1/04**

[52] **U.S. Cl.** **141/1**; 141/114; 141/313

[58] **Field of Search** 141/1, 2, 114, 141/313; 222/95, 206, 215, 386.5

[56] **References Cited**

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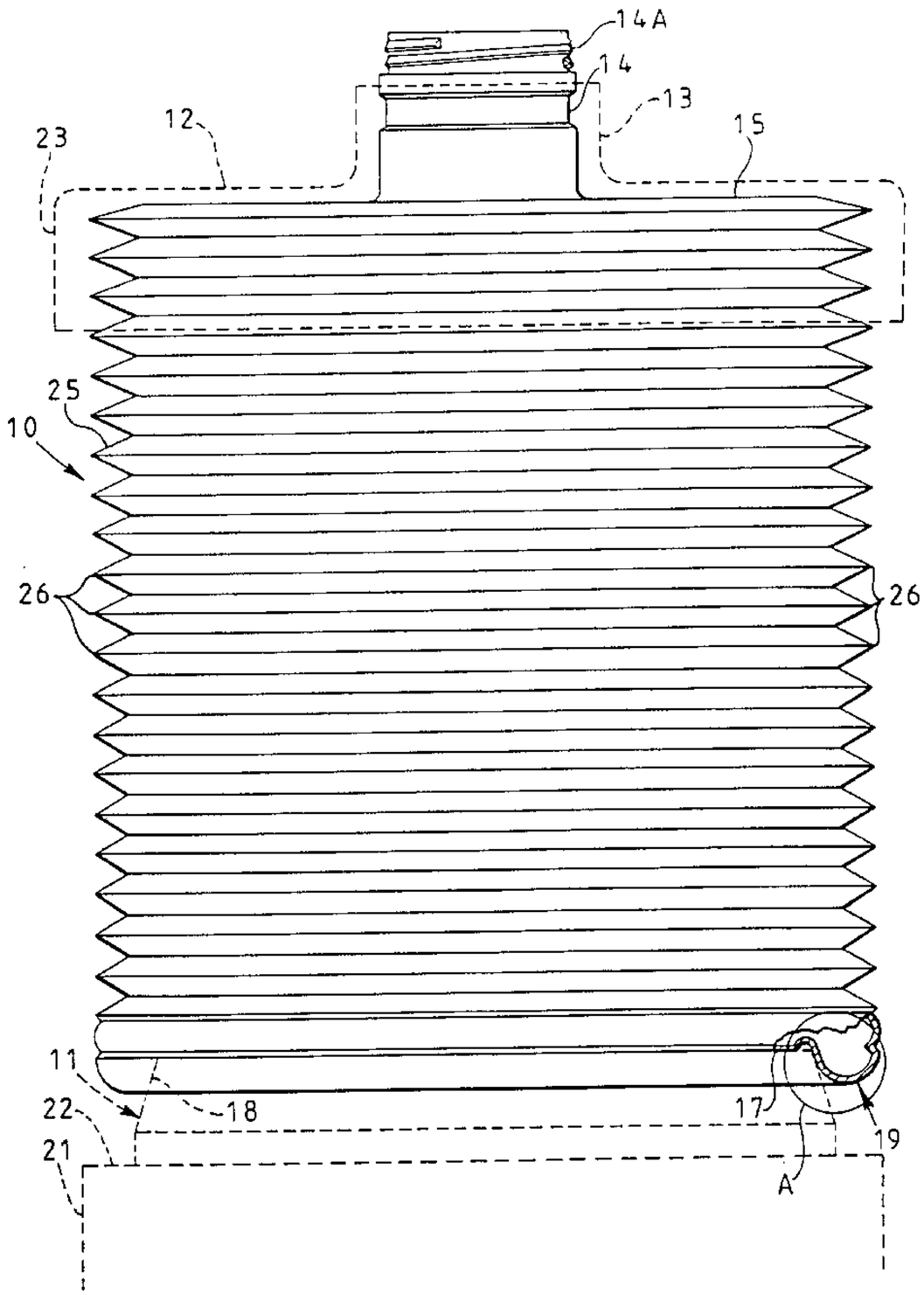
[57] **ABSTRACT**

A deformable container is provided which is especially intended for dispensing semi-solid product. It has two end walls at opposite ends and in one end wall is provided an opening through which product is dispensed from he container. The side wall of the container is formed in the manner of a concertina by the provision of pleats and the widths of the pleats differs over the length of the container being greater over the pleats adjacent the end wall having the outlet compared with the depth adjacent the opposite end wall. The invention also provides a method of filling the container in which the container is initially fully deformed and product enters through the opening and causes the container to move towards its extended position.

5 Claims, 3 Drawing Sheets



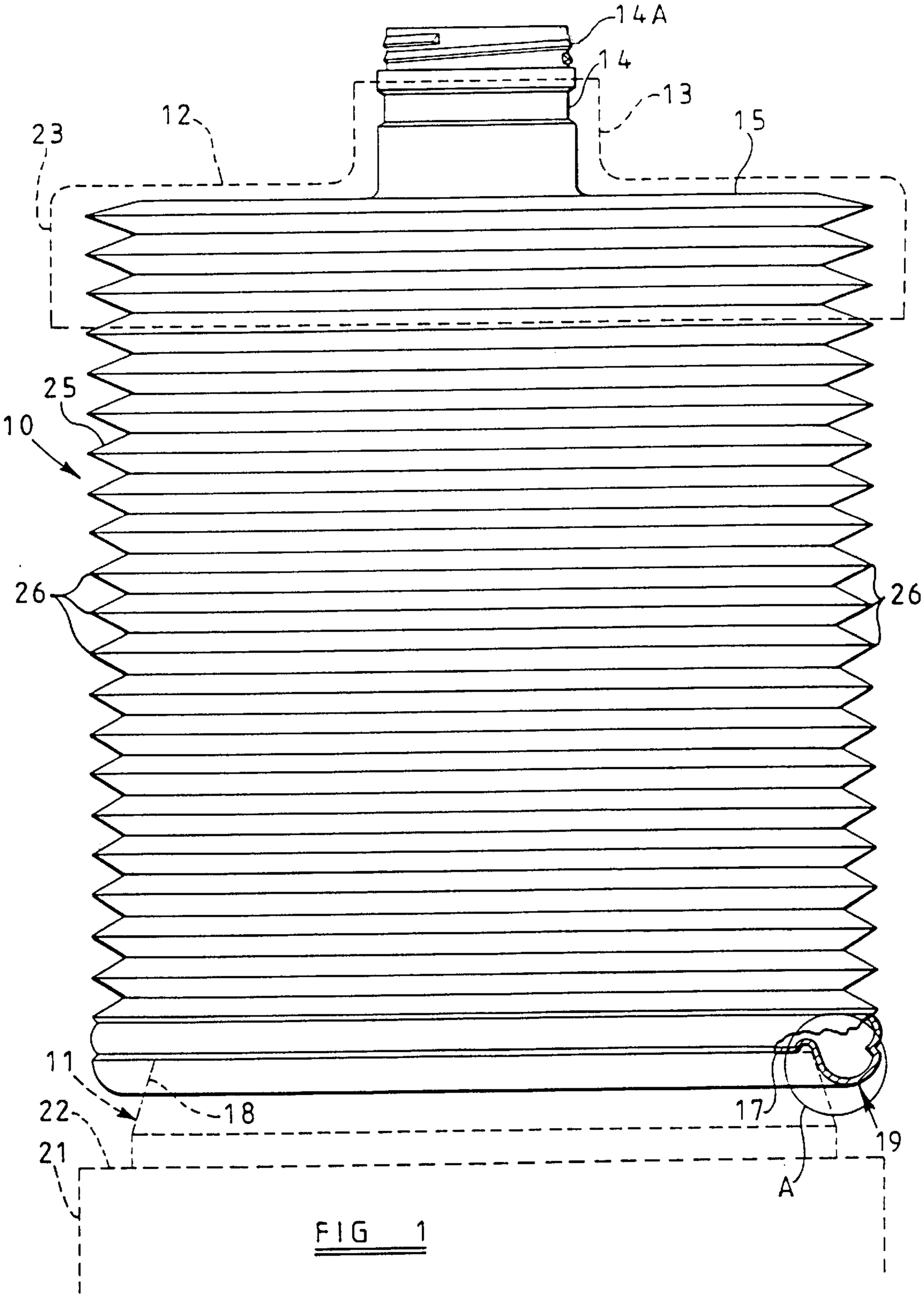


FIG 1

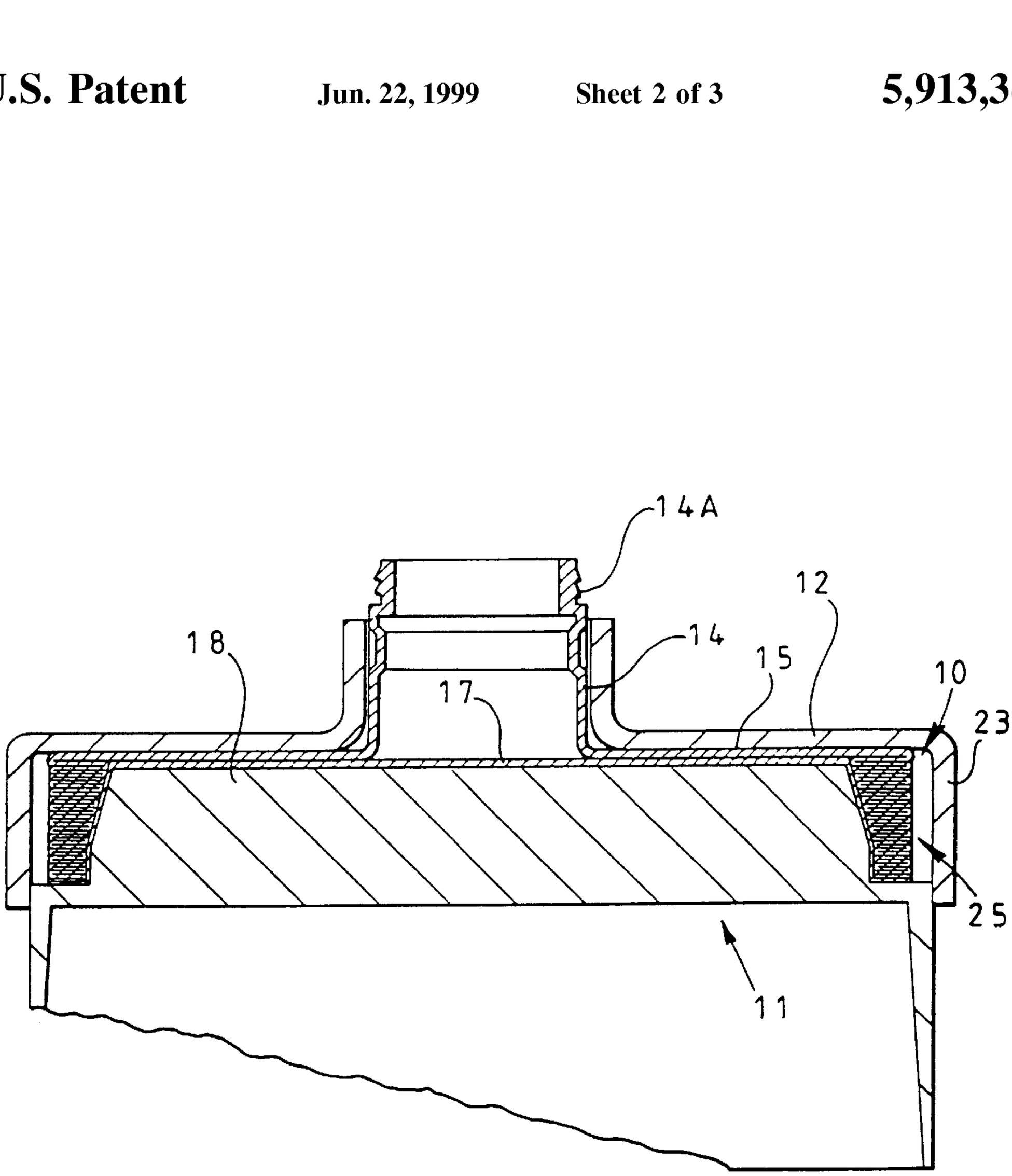


FIG 2

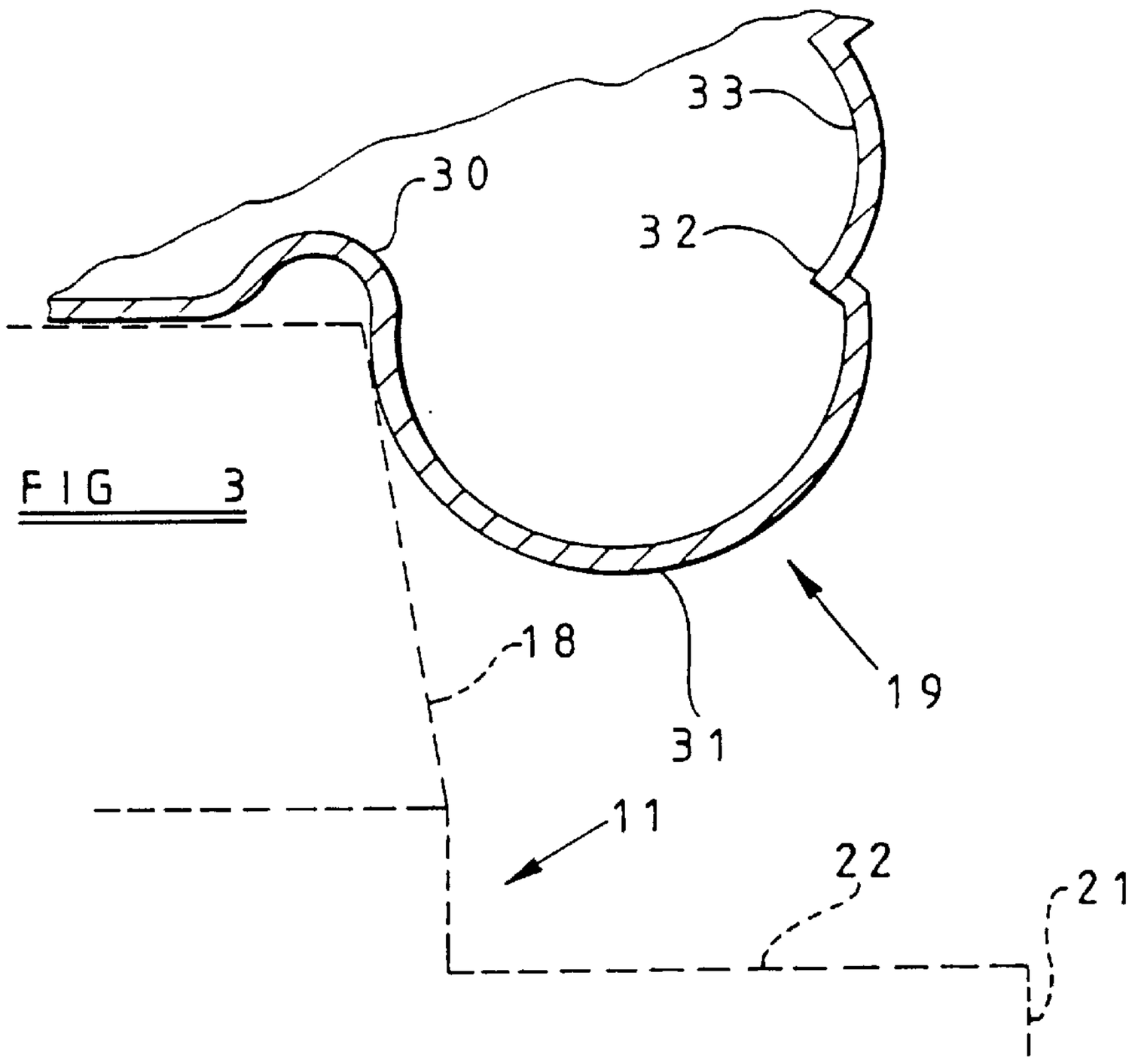


FIG 3

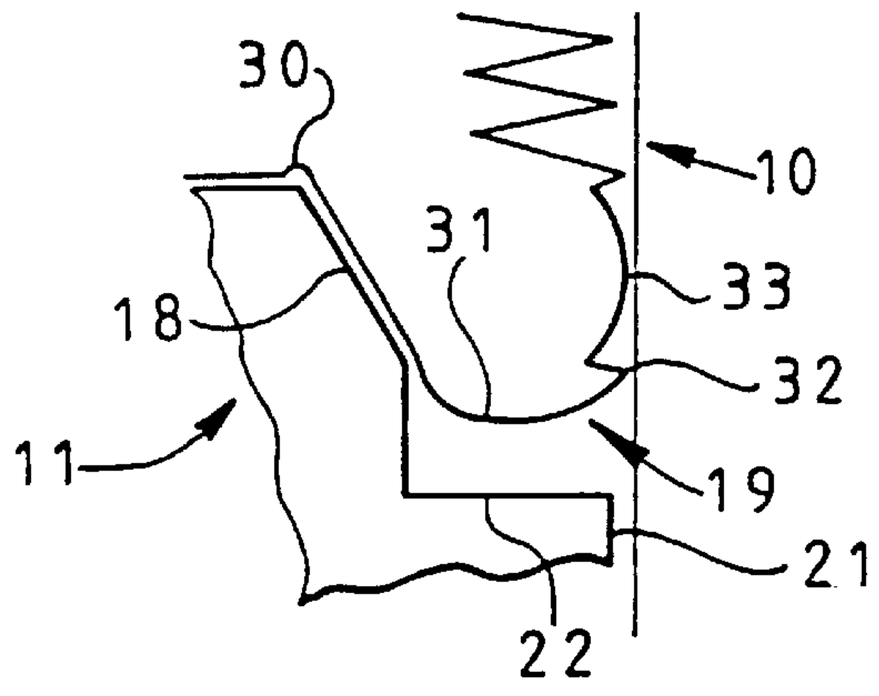


FIG 4

FIG 5

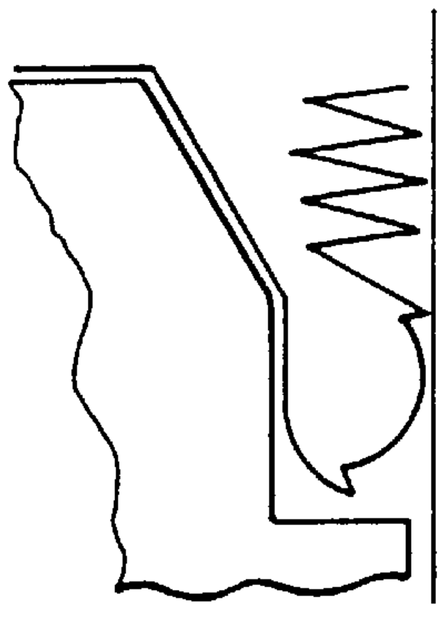


FIG 6

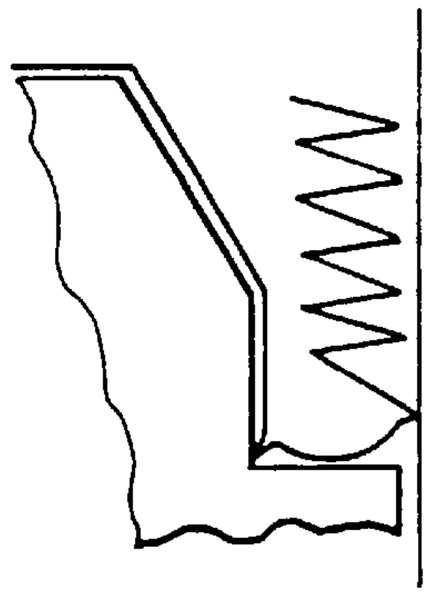
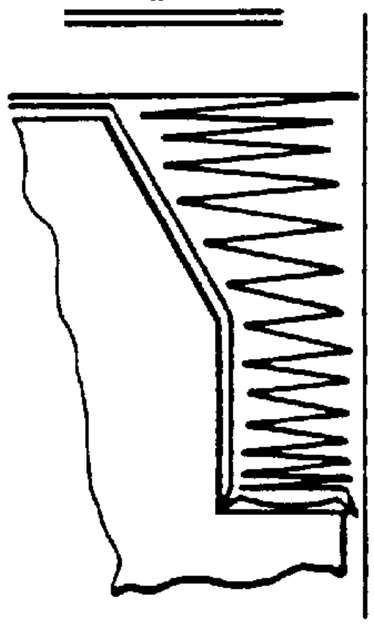


FIG 7



DEFORMABLE CONTAINER

This invention relates to deformable containers in particular containers for use in dispensing machines, the containers being intended to be deformed to discharge the contents thereof.

Deformable containers have been proposed which are of generally cylindrical shape having end walls at opposite ends, one end wall including an opening and the other end wall being arranged to be engaged to move the end walls relative to one another. During such movement the side walls are deformed and the side walls may have a concertina-like formation to enable deformation to take place to reduce the length and volume of the container and discharge the contents of the container. With the concertina-like formation the side wall may comprise a plurality of pleats which close up and open out during deformation of the container.

When the contents of the container are viscous or semi-solid it is important that the internal volume of the container is reduced to a minimum upon full discharge of the container, to ensure that the contents are substantially eliminated from the container.

An object of the invention is to provide an improved deformable container.

According to the invention a deformable container of generally cylindrical shape comprises end walls at opposite ends, one end wall including an opening and the other end wall being arranged to be engaged to move said other end wall relative to said one end wall to deform the side walls, the side walls having a concertina-like formation whereby the side walls deform upon said movement to reduce the length of the container, wherein the side walls comprise a plurality of pleats and the depth of the pleats differs over the length of the container.

Conveniently the depth of the pleats is greater towards the end of the container having said one end wall and said opening. In one arrangement said other end wall of the container is provided with a central portion to be engaged by a plunger for moving the end walls towards one another and an outer portion of said other end wall between said central portion and the concertina-like formation, said outer portion being flexibly arranged to permit the plunger to move initially along the container towards said one end and relative to the side wall to take up a position within said side wall without substantial deformation of said side wall. Such movement, upon continuation, causes deformation of the concertina-like formation.

Preferably the outer portion is of curvilinear shape and is outwardly convex before deformnation.

Conveniently there is provided a notch or kink in said outer portion which, upon deformation of said portion, engages a shoulder on said plunger.

Although the container is described as cylindrical it may take other forms such as eliptical, rectangular with rounded corners, or other curvilinear shapes.

The invention also provides a method of filling and discharging deformable containers of the kind described above in which the container is initially deformed so that its internal volume is reduced, preferably to a minimum, admitting product into the container through said opening while the container is deformed to increase its internal volume, continuing filling the container until it is substantially full of product, the container then being dischargeable by engaging the end of the container remote from the opening to deform the container to reduce its internal volume, and discharge product from said opening.

In the method of the invention a product discharge nozzle may be sealingly engaged over the opening so that as the volume of the container is increased the product admitted to the container completely occupies the increased space within the container. Preferably the container at the commencement of filling with product is substantially completely deformed to a position in which there is minimum volume within the container and deformation to increase its internal volume is resisted. In this way the container is filled with product with a minimum entrapment of air within the container and with a rapid filling rate.

Further features of the invention will appear from the following description of an embodiment of the invention given by way of example only and with reference to the drawings, in which:

FIG. **1** is a side elevation of a deformable container, FIG. **2** is a cross-section of the container of FIG. **1** in its fully deformed position, incorporated in a container discharge/filling apparatus,

FIG. **3** shows an enlarged view of the container over the region A of FIG. **1** and

FIGS. **4**,**5**,**6** and **7** show the part of the container of FIG. **3** as the container is deformed during discharge.

Referring to the drawings and firstly to FIG. **1** there is shown a cylindrical container **10** in its fully extended position, i.e. with maximum internal volume. In FIG. **1** the container **10** is shown engaged at one end by a plunger or piston **11** and at the other end located against an abutment **12** in which is formed an opening **13** through which extends an outlet tube **14** of the container **10**. The outlet tube **14** is formed at one end of the container **10** in an end wall **15** which extends generally at a right angle to the axis of the container **10**. At the opposite end of the container **10** is formed an end wall **17** which, as shown, is recessed into the container and is engaged by a head portion **18** of the plunger **11**, the portion **18** tapering inwards and having a flat end engageable with the end wall **17** which is also has a substantially flat portion which is located centrally of the container **10**.

The end wall **17** engaged by the plunger **11** has a portion **19** extending around the central flat portion of the end wall **17** which is of a shape more clearly shown in FIG. **3**. The plunger **11** has a further cylindrical head portion **21** defining between it and the portion **18** a shoulder **22**. The abutment plate **12** defines a cylindrical portion **23** extending towards the plunger **11** over a distance such that when the container **10** is fully deformed the portion **21** of the plunger enters the lower end of the cylindrical portion **23** of the abutment **12**, as shown in FIG. **2**.

A cylindrical side wall **25** of the container is formed with a plurality of pleats **26** arranged along the full length of the container **10**, the pleats **26** being opened out to the position shown in FIG. **1** in the fully extended position of the container and being closeable up to the position shown in FIG. **2** when the container has its minimum internal volume, the container side wall acting in the manner of a concertina.

The outer peaks of the pleats **26** lie on a substantially constant diameter cylinder but the radially-directed extent or width of the pleats is different over the length of the container **10**. Thus the pleats **26** have a minimum width towards the end of the container to be engaged by the plunger **11** and at the opposite end of the container **10** the pleats **26** have a greater width. As shown in FIG. **1** several of the pleats **26** nearest to the end wall **17** are of the same width then, as the pleats get progressively closer to the end wall **15**, the widths of the pleats progressively increases, as shown in FIG. **1**. It will appear from FIG. **2** that the

increasing width of the pleats towards the end wall **15** accommodate the taper of portion **18** of the plunger **11**. Moreover in the fully deformed position of the container **10** the end wall **17** of the container lies closely adjacent to the opposite end wall **15** and with the plunger **11** fully compressed the plunger lies adjacent the inner sides of the pleats **26**. If required the outer diameter of the pleats **26** can be different in particular the pleat **26** adjacent the end wall **15**.

Referring now to FIG. **3** the outer portion **19** of the end wall **17** connected to the side wall **25** is of generally curvilinear shape. More particularly the portion **19** has a shape which, adjacent the flat end wall **17**, is initially arcuate and concave, and of small radius at **30**. A larger radius arcuate and outwardly convex portion **31** follows, succeeded by a notch or kink **32** and a further arcuate and outwardly convex portion **33**. The shaping of the portion **19** is intended to bring about progressive deformation of the container **10**, upon engagement by the plunger **11** in the manner shown in FIGS. **3–7** which are self explanatory. As a result of the shape of the portion **19**, the plunger **11** enters the container **10** and moves into the container before any substantial compression of the pleats **26** at that end of the container takes place.

During this movement the central portion **17** of the end wall moves upwardly (as seen in FIG. **1**) and the flexible outer portion **19** flexes so that the part **30** of the portion is located at the outer corner of the plunger and the kink **32** engages into the shoulder **22** of the plunger. Thereafter compression of the pleats adjacent that end of the container takes place in the region above the shoulder **22**.

After the container, during a discharge stroke of the plunger **11**, has taken up the position shown in FIG. **7** continued movement of the plunger in FIG. **7** causes the pleats **26** along the length of the container to be closed up until at the completion of a stroke, the container takes up the position shown in FIG. **2** in which the product is fully discharged from the container through the opening defined by outlet tube **14**, leaving product only within the tube **14**. At this position the corrugations or concertina portions of the side wall of the container are located between the head **18** of the plunger **11**, the shoulder **22** of the plunger **11** and the inside wall of the cylindrical portion **23** of the abutment plate **12**. The wall **17** at one end of the container **10** is closely adjacent or in contact with the end wall **15** at the other end of the container.

In filling the container **10**, the container may initially be fully compressed in an empty condition to the position shown in FIG. **2**. The tube **14** is sealingly connected to a discharge duct for product (not shown) so that product may enter the container in through the tube **14** without any ingress of air. As product is discharged into the tube **14** the wall **17** of the container is pushed away from the tube **14** towards an extended position, such movement being in accordance with the amount of product entering the container. Such movement is normally by pressure of product entering the container with or without an abutment, similar to the plunger **11** engaging the container to provide resisted movement to entry of product.

During filling of the container **10** means may be provided for ensuring that the container is filled with a predetermined quantity of product. This may be any one or more of the following controls. The container may be filled until it has reached a predetermined length, filled for a predetermined period, filled with a predetermined weight or with a predetermined volume of product. Filling machines often aerate the product before or during filling and a measure of the adequacy of the aeration achieved can be made during filling by measuring the volume of product in the container and comparing it with the weight. Suitable measuring means determining the position and weight of the container and the filling time may be utilized for this purpose.

When the container **10** is filled with product the product discharge duct is disconnected from the tube **14** and a closure member (not shown) is screwed onto the outer end of the duct **14**, this being screw-threaded as at **14A**. The filled container may then be heat treated by freezing and transported to a point of use location at which the product may be discharged in a dispensing machine which may be of the kind described in British Patent specifications number 2213532.

The invention provides an improved container and method of use thereof by which utilization of the container is improved, product wastage is reduced and filling efficiency is enhanced.

I claim:

1. A deformable container of generally cylindrical shape which comprises end walls at opposite ends, a side wall extending between the end walls, one end wall including an opening and the other end wall being arranged to be engaged whereby such engagement moves said other end wall relative to said one end wall to deform the side wall, the side wall having a concertina-like formation whereby the side wall deforms upon said movement to reduce the length of the container, wherein the side wall comprises a plurality of pleats and the radially directed extent of the pleats differs longitudinally of the container, the pleats having radial inner edges and radial outer edges, said other end wall of the container being provided with a central portion arranged to be engaged by a plunger for moving the end walls towards one another, and with an outer portion of said other end wall between said central portion and the concertina-like formation, said outer portion being flexibly arranged to permit the plunger to move initially along the container towards said one end wall and relative to the side wall to take up a position within said side wall without substantial deformation of said side wall, further movement of the plunger deforming the side wall.

2. A deformable container according to claim **1** wherein the depth of the pleats is greater towards the end of the container having said one end wall and said opening.

3. A deformable container according to claim **1** wherein said outer portion is of curvilinear shape and is outwardly convex before deformation.

4. A deformable container according to claim **1**, comprising a notch in said outer portion which, upon the formation of said portion, engages a shoulder on said plunger.

5. A deformable container according to claim **1**, wherein the central portion and the outer portion of said other end wall, and the side wall of the container adopt a position during a deformation in which the outer portion is tapered outwardly to generally conform in shape to the deformed shape of the side wall at radial inner edges of the pleats.

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